

## **Mt. Hope Bay and Taunton River Study Area**

Compiled from drafts by Kim Groff and Richard Carey

DRAFT April 11, 2017

The Marine Dissolved Oxygen Criteria Review for the Mt. Hope Bay and Taunton River will be spatially limited to the portions of Mt. Hope Bay that are in Massachusetts and the mainstem of the Taunton River upstream of the Taunton WWTP. The upstream limits for the study were considered relative to habitat conditions as they effect dissolved oxygen requirements and marine aquatic life uses. In addition, analytical requirements and criteria application context were considered in making the definition of the study area. Salinity guidance was used to define the habitat conditions that support marine species. For the purposes of this evaluation fresh waters are defined as salinities generally below 0.5 ppt and marine and brackish waters as defined as salinities >0.5 ppt. In tidally influenced estuaries salinity follows a gradient that is dependent on the tidal cycle.

MassDEP considered three options for drawing the line for the spatial upstream extent of the Marine Dissolved Oxygen Criteria Review for MHB/Taunton River: (1) the Berkley Bridge; (2) above the Taunton WWTP; and (3) above the INIMA facility, but below the Taunton WWTP.

MassDEP reviewed the salinity data (summarized in Figure 1-3) from multiple sources and there is evidence to suggest that low levels of salinity are found at the salt wedge at the bottom of the Taunton River at 1 PPT or above (based on conductivity equivalence) as far up river as the Taunton Municipal light plant (Permit MA000224, fact sheet). Salt water species have been documented in this area as well, including bluefish and flounder. This location will include all the saline portions of the river throughout the water column under the range of tidal conditions. It will also include major tributaries of the Taunton River with tidal influence.

Data from the 1970 Taunton River Study (Taunton River Study: Lower Taunton River [1971]) provides additional evidence to support extending the study area above the Taunton WWTP. Salinities in the 1970 study were measured at the Berkley Bridge (Station TR41; high tide: 14.1 to 14.9 ppt; low tide: 0.4 to 0.6 ppt), 1.9 river miles upstream from TR41, above the confluence with the Three Mile River (Station TR40; high tide: 4.4 to 9.3 ppt; low tide: 0.1 to 0.4 ppt), and 1.6 river miles upstream from TR40, above the Taunton WWTP (Station 39; high tide: 0.2 to 0.4 ppt; low tide: 0 to 0.3 ppt) (Figure 1). A Taunton River Basin: 1986 Water Quality Survey (1988) showed similar salinity patterns, though with less detail. Salinity dropped from 10.0 ppt at a sampling station below the confluence with the Segreganset River to 0.0 ppt at a station below the power plant in Taunton (Taunton Municipal Lighting).

Including the river reach above the Taunton WWTP would likely produce the most inclusive species list for DO analysis and includes the portion of the river that transitions to fresh water under all tidal conditions. It would include not only saltwater species, but also freshwater species that can tolerate periodic low salinity levels. Any criteria derived from this broader species list would be conservative, ensuring protection of species in the Mt. Hope Bay and the upper tidal reaches of the Taunton River.

Drawing the furthest upstream option will be inclusive of the WWTPs in the saline portion of the estuary/river and ensure consistency with the mix of freshwater and marine species that are tested in the following permits:

- a) Taunton WWTP (NPDES permit MA0100897): this facility conducts toxicity testing using the freshwater organisms *Ceriodaphnia dubia* and *Pimephales promelas*, even though the discharge is technically to an estuarine segment.
- b) Taunton Municipal Lighting (NPDES permit MA0002241): this facility conducts toxicity testing using the freshwater organism *Ceriodaphnia dubia*.
- c) INIMA Company Desalinization (NPDES permit MA0040193): this facility conducts toxicity testing using the marine organism *Menidia beryllina*.

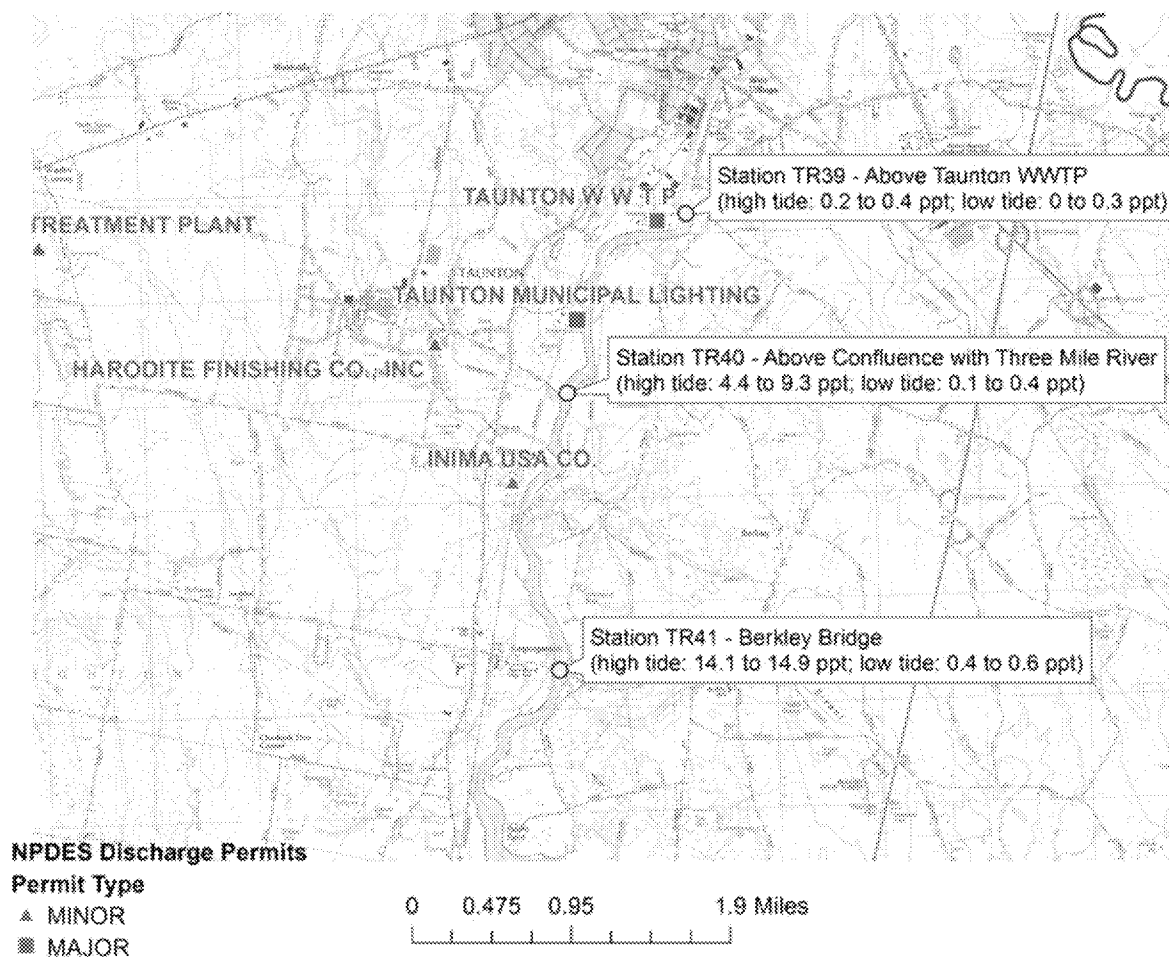


Figure 1. Upper reaches of the Taunton River, showing landmarks and three options for limiting the upper boundary of the study area, with salinities sampled at high and low tides.

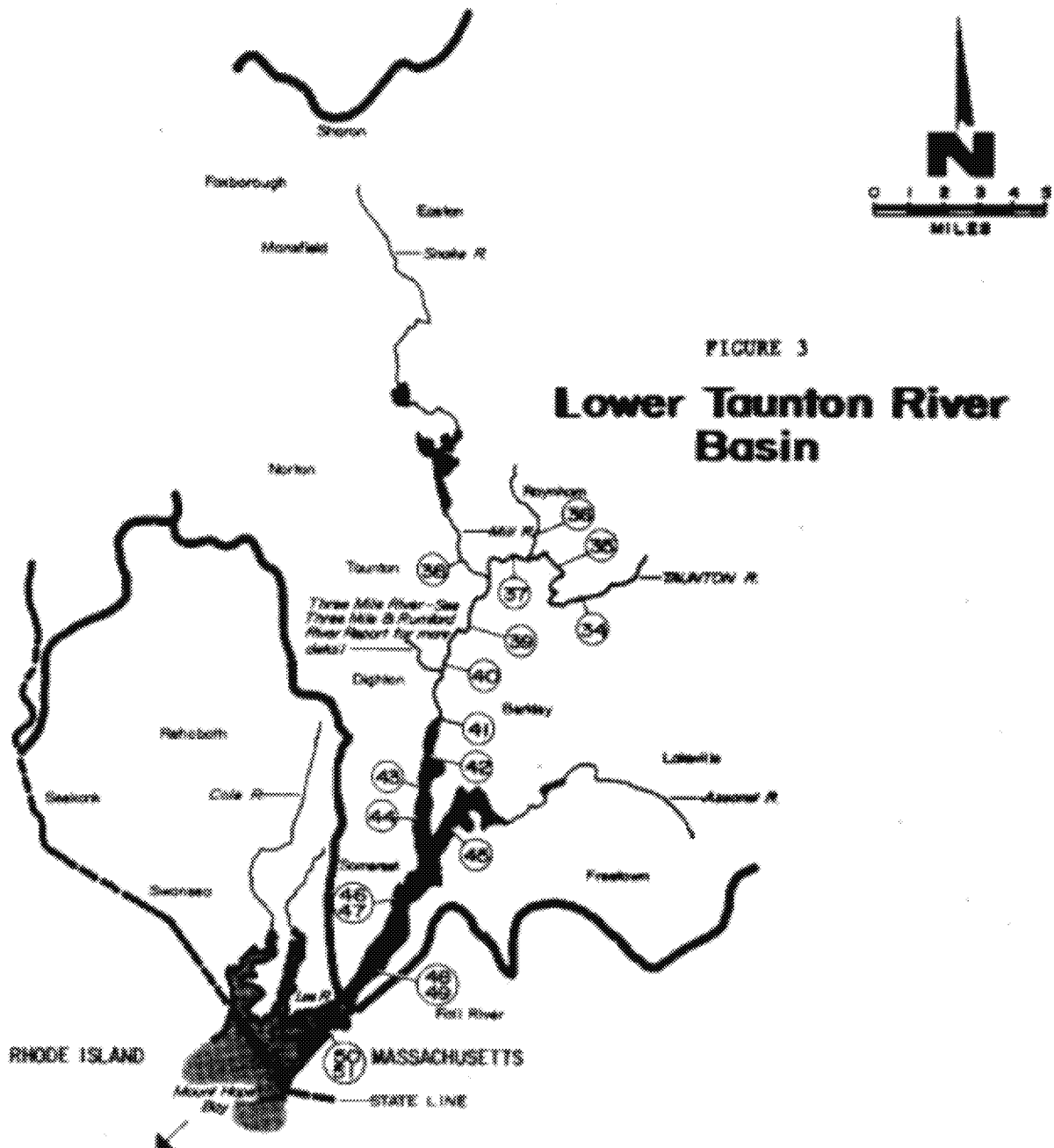


Figure 2. Site locations for the 1970 Lower Taunton River Study (1971). Stations 39 – 41 are addressed in the text.

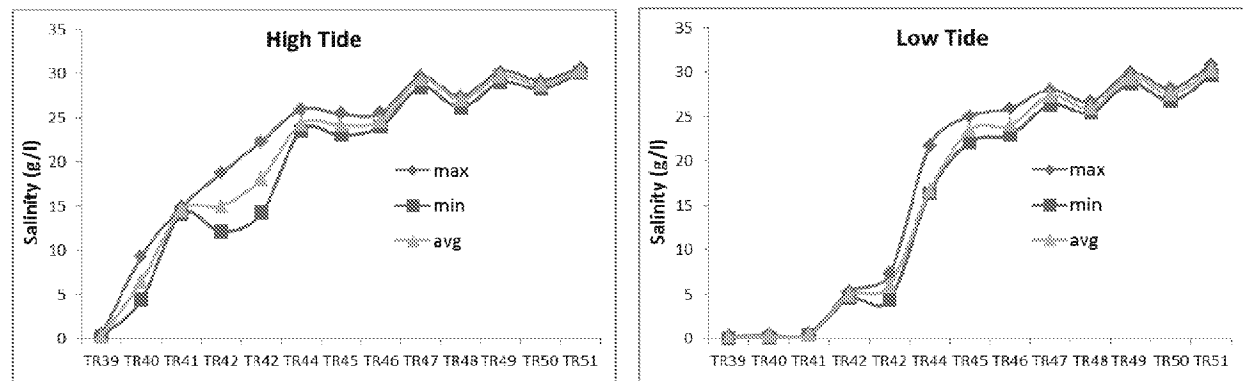


Figure 3. Salinity gradients from upstream to downstream site locations of the 1970 Lower Taunton River Study (1971), showing high and low tide statistics.

#### Implications for analysis

More specificity in deriving criteria could be gained by segregating species lists by habitat suitability, if it is deemed appropriate and sufficiently defensible. For example, marine species generally inhabit areas with higher salinity. Of course, this is a vague description because fish and other mobile species can move depending on salinity tolerances/preferences, other threats/opportunities, and salinity variability with tides and seasons. Therefore, marine species can be found in brackish and freshwater reaches. Likewise, freshwater species can use areas with higher salinities for short periods to take advantage of resources.

However, a general division of saline vs brackish/fresh environments and association with marine vs freshwater species might yield different DO thresholds in multiple habitat categories. If the most DO-sensitive species are found in both marine and brackish/freshwater environments, then segregating species lists for analysis might not yield different DO thresholds. With a broader range of environmental conditions introduced when extending the study area, the analysis approach will include first an area-wide Virginia Province approach and then habitat-specific analyses similar to the Chesapeake Bay approach.

#### Shellfish suitability and growing areas

The Department of Marine Fisheries (DMF) took over the shellfish program from MassDEP in 1988. Upstream limits of shellfish growing areas are generally set by shellfish surveys. DMF's upstream growing area limits were not necessarily based on salinity and were never meant to be a fresh/salt boundary. In certain cases, MassDEP's Surface Water Quality Standards (SWQS) delimit the upstream extent of Class SA or SB waters (marine/estuarine waters) differently than DMF delimits the upstream bounds of its Shellfish Growing Areas. Most or perhaps all of Massachusetts commercially important shellfish species (e.g., Eastern Oyster, Softshell Clam, Northern Quahog, Surf Clam, Atlantic Razor Clam, and Blue Mussel) have less tolerance to low salinities; perhaps the most tolerant species are oysters. Shellfish growing is prohibited above Winslow Point in Freetown and in the open bay south of Brayden Point (Figure 4). DMF prohibits areas to shellfishing in its classification for a variety of reasons including management closures, lack of water quality information, seed relay and elevated bacteria. No suitable habitat

for shellfish are identified above Berkley Bridge and only American oysters range that far upstream (Figure 5).

As one moves upstream into estuarine waters with lower salinity, fewer razor clams, softshell clams, and quahogs are encountered. Ribbed mussels (*Geukensia demissa*), which have a greater tolerance to low salinity waters (it can tolerate salinity in the single digits), then become more prevalent. In their original upstream demarcation from 1988-1989, DMF tried to set a line at a place where no ribbed mussels were found upstream. Since then, DMF has found a few individual ribbed mussels upstream or above their designated shellfish growing areas.

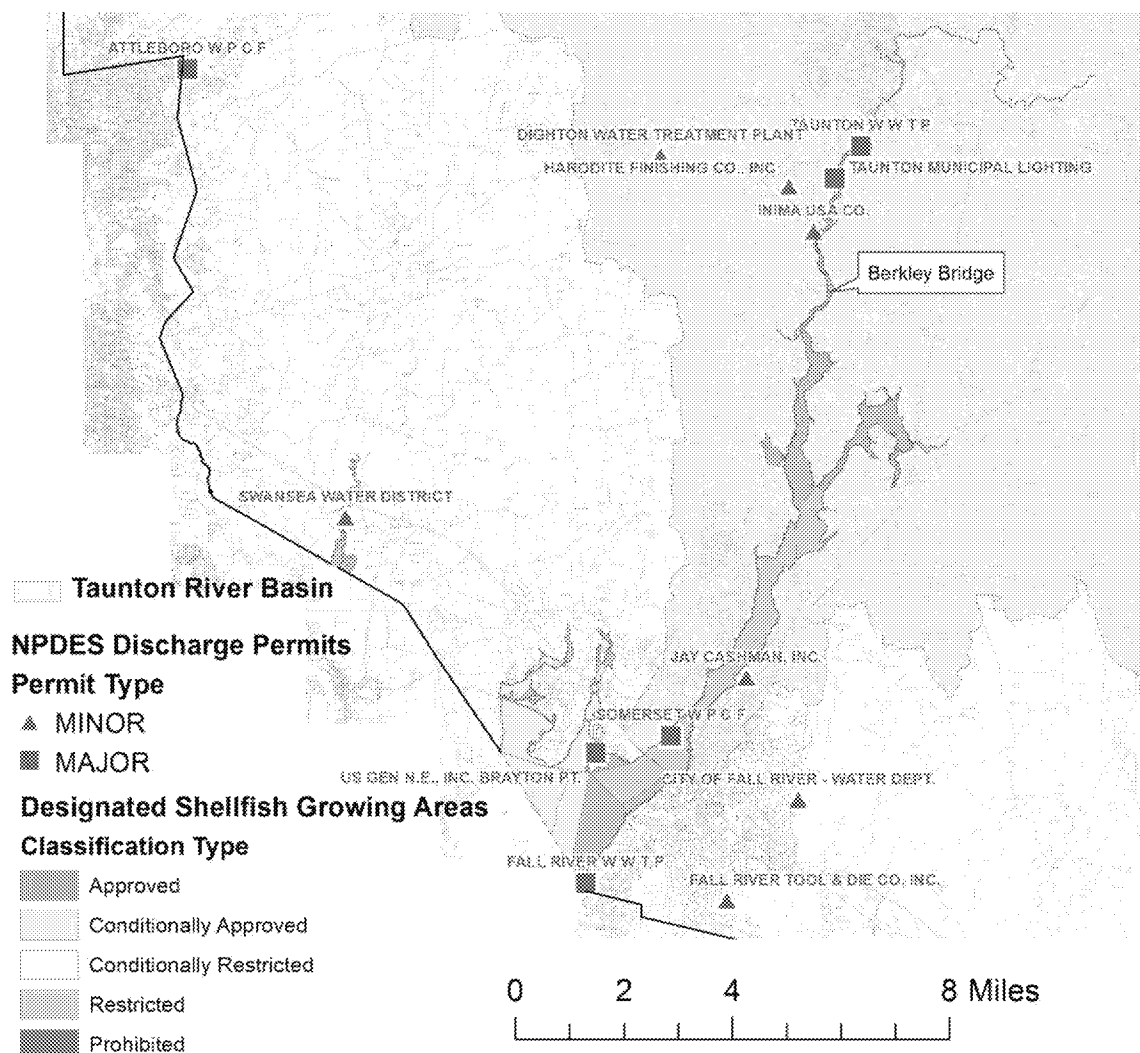


Figure 4. Shellfish growing areas.

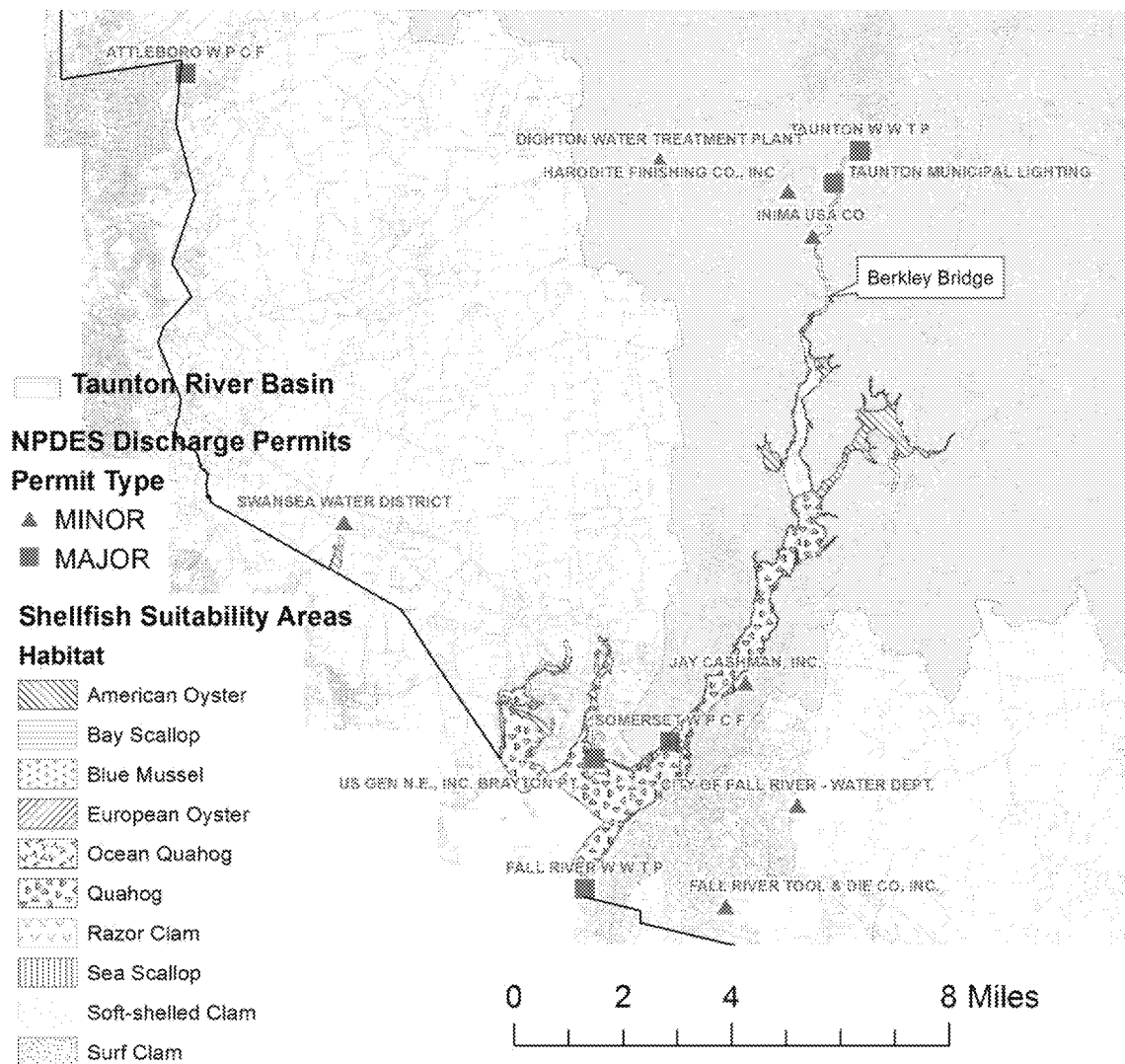


Figure 5. Shellfish suitability areas by species.

#### DEP Surface Water Classes

Waters in the study area are classified as SA and SB coastal and marine waters (MassDEP SWQS) (Figure 6). Class SA waters are designated as excellent habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation. Where designated, these waters shall be suitable for shellfish harvesting without depuration. These waters shall have excellent aesthetic value. DO in class SA waters shall not be less than 6.0 mg/l. Where natural background conditions are lower, DO shall not be less than natural background. Natural seasonal and daily variations that are necessary to protect existing and designated uses shall be maintained.

Class SB waters are designated as habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation. Where designated, these waters shall be suitable for shellfish harvesting with depuration. These waters shall have consistently good aesthetic value. DO shall not be less than 5.0 mg/l. Seasonal and daily variations that are necessary to protect existing and designated uses shall be maintained. Where natural background conditions are lower, DO shall not be less than natural background. Most but not all of the water that receive WWTP effluent in coastal areas are Class SB.

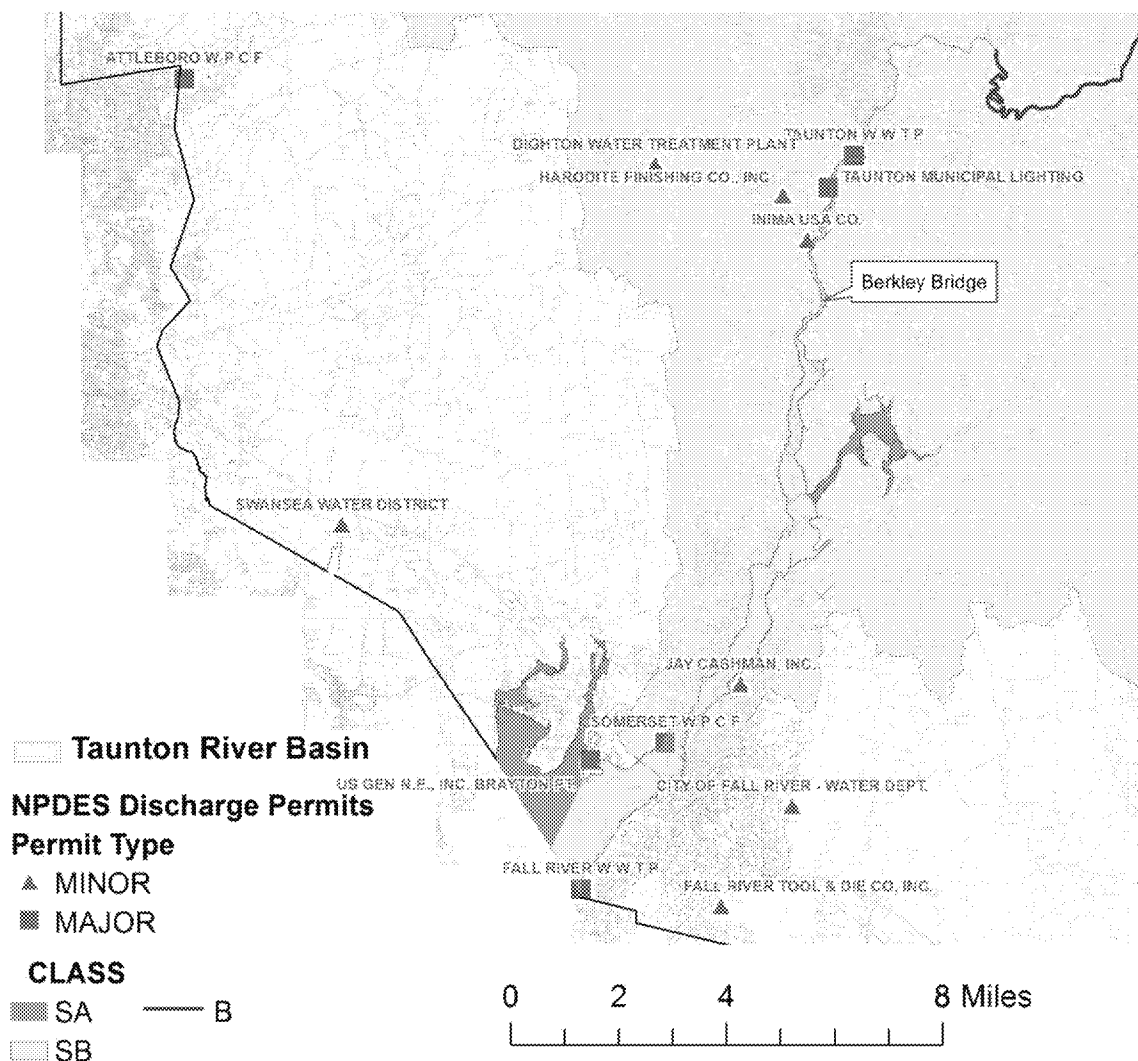


Figure 6. MassDEP Surface water classes and NPDES discharge locations.